Customer No.: 31561
Application No.: 10/604,884
Docket No.: 9761-US-PA

REMARKS

Present Status of the Application

The Office Action rejected all presently pending claims 10-24. Specifically, claims 10-15 and 18-24 were rejected under 35 U.S.C. 102(a) as being anticipated by Batra et al. (US 2003-0235064 A1), and claims 16-17 rejected under 35 U.S.C. 103(a) as being unpatentable over Batra et al. in view of Wolf, Vol. 1, pages 340-359. A new title clearly indicative of the invention to which the claims are directed is also required. In response thereto, a new title is provided, and reconsideration of claims 10-24 is respectfully requested.

Summary of the Invention

This invention is directed to a method for fabricating a non-volatile memory cell. In the method, a first insulating layer, a *metal oxide layer* and a second insulating layer is sequentially formed on a substrate. An annealing is then performed to convert the *metal oxide layer* to metal nano-particles with *thermal dissociation*, while the first insulating layer, the second insulating layer and the metal nano-particles together constitute a charge-trapping layer. Thereafter, a gate and a source/drain are respectively formed.

Discussion of Office Action Rejections under 35 U.S.C. 102(a)

Claims 10-15 and 18-24 were rejected under 35 U.S.C. 102(a) as being anticipated by Batra et al.

As mentioned above, one of the features of this invention is forming a metal oxide layer over a substrate and then performing an annealing to convert the metal oxide layer to metal nano-particles with thermal dissociation. The feature is recited in independent claim 10 as follows, marked by underlines:

10. A method for fabricating a non-volatile memory cell, comprising:
providing a substrate;
sequentially forming a first insulating layer, a metal oxide layer and a second insulating layer on the substrate;
performing an annealing to convert the metal oxide layer to a plurality of metal nano-particles with thermal dissociation, while ..... constitute a charge-trapping layer;
forming a gate ..... a source/drain in the substrate beside the gate.

The Office Action asserts in Page 2 that Batra et al. disclose forming a *metal oxide layer 23* and then performing an annealing to convert the *metal oxide layer* to metal nano-particles with thermal dissociation.

However, the layer 23 in Batra et al. is actually *metal nano-crystals 23* (e.g., Pt nano-crystals), as described in lines 1-2 of [0021], but *not a metal oxide layer* (e.g., a PtO_x layer). More specifically, Batra et al. actually disclose *directly depositing metal nano-particles 23* on the tunnel oxide layer, or depositing a *metal (platinum)* and then performing an annealing to convert the *metal (platinum)* to metal (platinum) nano-crystals 23, as clearly described in lines 7-17 of [0021]:

" ..... ***Platinum nano-crystals are preferably deposited using a chemical vapor deposition process wherein, for example, (trimethyl)-methylcyclopentadienyl platinum (IV) is reacted with oxidizing gases such as O_2 and N_2O at about 380-420 °C.*** *to deposit platinum on the tunnel oxide layer 22 which self-forms as nano-crystals 23* ***on the tunnel oxide layer 22. In addition to the deposition process, the substrate may be annealed at a temperature of from about 200°C. to about 800°C., preferably in the presence of N_3 or O_2 in a vacuum atmosphere,*** *to convert the platinum to small nano-crystaltine beads. .....*"

Obviously, Batra et al. fail to teach or suggest the above feature of claim 1: forming a *metal oxide* **layer (e.g., a PtO_x layer) and then performing an annealing to convert the** *metal oxide* **layer to metal nano-particles. Meanwhile, there is** *no thermal dissociation* **in the annealing process at 200-800°C in Batra et al., because the starting material and the product both are metal.**

For at least the reasons mentioned above, Applicants respectfully submit that independent claim 10 patently defines over the prior art.

As for claim 11, the Office Action asserts in Page 3 that claim 40 of Batra et al. further discloses forming several *metal oxide layers* **and** *insulating layers* **so that multi-layers of metal nano-particles are formed with the annealing. However, Applicants respectfully point out that claim 40 of Batra et al. merely mentions an insulating layer that comprises a stack of layers comprising at least one** *SiO_2 layer* **formed over at least one** *advanced dielectric layer*. **Obviously, no** *metal oxide layer capable of producing metal nano-particles* **is included in the insulating layer in claim 40 of Batra et al.**

For at least the reason mentioned above and the same reasons applied to claim 10, Applicants respectfully submit that claim 11 dependent from claim 10 also patently defines over the prior art.

As for claims 12-15 and 23, the Office Action asserts in Page 3 that Batra et al. disclose the possible materials, forming methods and processing methods of the *metal oxide layer*. However, no *metal oxide layer capable of producing metal nano-particles* is formed in Batra et al., as mentioned above.

For at least the reason mentioned above and the same reasons applied to claim 10, Applicants respectfully submit that claims 12-15 and 23 dependent from claim 10 also patently define over the prior art.

As for claims 18-19, 20-22 and 24, Applicants respectfully submit that claims 18-19, 20-22 and 24 dependent from claim 10 also patently define over the prior art, for at least the same reasons applied to independent claim 10.

Discussion of Office Action Rejections under 35 U.S.C. 103(a)

Claims 16-17 that are indirectly dependent from claim 10 were rejected under 35 U.S.C. 103(a) as being unpatentable over Batra et al. in view of Wolf.

As mentioned above, Batra et al. fail to teach or suggest the above feature of claim 10: forming a metal oxide layer and then performing an annealing to convert the metal

oxide layer to metal nano-particles. Wolf either does not teach or suggest the above feature. Therefore, at least the feature of claims 16-17 that is inherited from claim 10 cannot be obtained by combining Batra et al. and Wolf.

For at least the reason mentioned above and the same reasons applied to claim 10, Applicants respectfully submit that claims 16-17 also patently define over the prior art.

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CONCLUSION

For at least the forgoing reasons, it is believed that pending claims 10-24 are in proper condition for allowance. If the Examiner believes that a telephone conference would expedite the examination of the above-identified patent application, the Examiner is invited to call the undersigned.

Respectfully submitted,

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